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BOARD OF CONTROL

(England and Wales)

Pre-Frontal Leucotomy in 1,000 Cases

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BOARD OF CONTROL (ENGLAND AND WALES)

Pre-Frontal Leucotomy
in 1,000 Cases

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1947

INTRODUCTION

CONTENTS

FOREWORD

This report is designed to place at the disposal of those interested the results of pre-frontal leucotomy, as disclosed by the information furnished to the Board in response to the inquiry which we initiated early in 1945. An attempt has been made to state simply what leucotomy is, why the operation is performed, what are the results so far ascertained, and what important questions about the operation and its effects remain at present unanswered.

The report is mainly the work of Dr. Isabel Wilson, Medical Commissioner of the Board, and of Mr. E. H. Warland, our Statistical Officer.

We desire to express our indebtedness to all who have furnished information in response to our inquiries and have provided material on which this Report has been built up.

Pre-Frontal Leucotomy in 1,000 Cases

INTRODUCTION

THIS report gives the result of pre-frontal leucotomy in 1,000 cases of mental disorder, as reported to the Board of Control in reply to a questionnaire.

Excluding three mental hospitals which were closed and one which had resident only a few working patients, the questionnaire was issued to each County and Borough Mental Hospital in England and Wales, to each Registered Hospital and to most of the Licensed Houses.

Completed returns were received from all hospitals which had undertaken this treatment up to the end of 1944,* i.e. from 32 county and borough mental hospitals (of a total of 97), from 6 of the 13 registered hospitals and from 5 licensed houses (of 36 circularized). With the consent of the General Board of Control for Scotland returns from the Crichton Royal Institution, Dumfries, and the Aberdeen Royal Mental Hospital were also included in our investigation. We thank all those who have helped to compile and send in the returns. When the questionnaire was sent out most of the hospitals were—as they still are—seriously short of staff in almost every department, the war was going on, some hospitals were under attacks by flying bombs or rockets and some had suffered damage involving casualties or, at least, the transfer of patients and much additional work. In these circumstances the preparation of the returns was a considerable burden and we much appreciate what has been done.

THE OPERATION

Outline.—Most readers will be familiar with leucotomy; a few words about it may be helpful to others. The word “leucotomy” means a cutting of the white matter—the white conducting fibres of the brain. The particular fibres concerned form a band known as the fronto-thalamic tract which connects the pre-frontal area of the frontal lobe with the thalamus. The pre-frontal or forward part of the frontal lobe is concerned with thought, but its precise functions are obscure; it is very difficult to establish the relationship between such aspects of thought as imagination, initiative and self consciousness on the one hand and any given part of the brain on the other. The thalamus has functions which are better known—they are concerned with feeling and emotion. There is a portion of the thalamus called the nucleus medialis dorsalis which degenerates when the fronto-thalamic fibres have been cut. The structures mentioned are bilateral.

Purpose.—crudely described the purpose of the operation is to break the connection between the patient's thoughts and his emotions. It is to relieve mental tension, to take the sting out of experience and thus to favour improvement or to hasten recovery from mental disorder. That at any rate seems to happen in successful cases.

Nothing so devastating occurs as an absolute severance of thought from emotion; if it did the patient would become completely dull and unresponsive.

The force or tension of emotion, and a dominance of the self in thought are often very evident in mental disorder. A melancholic may be so preoccupied with his sense of failure or ill-health and by his own feelings of guilt about it that he can talk of nothing else. The tension of the urge to scrupulosity and cleanliness may be so strong in the obsessional that he spends many hours a day carrying out rituals and becomes quite unfitted to lead a normal life. The schizophrenic may appear to be unemotional, but in fact he may be so

* Except one hospital which did not send a return and 2 licensed houses whose returns, covering 3 cases, were received too late for inclusion here.

dominated by the emotion associated with his hallucinations and phantasies that he is held as it were entranced or perhaps stimulated by them to sudden impulsive violence.

If emotional tension is lessened by leucotomy the patient may retain his ideas of ill-health, his thoughts of dirt and infection, or his hallucinations and delusions, but he ceases to care about them and is thus freed from their overwhelming power and can take up some everyday activities. If all goes well he will then lose his remaining symptoms and go on to recovery.

Freeman has stated recently that the operation can also be used to lessen the mental distress from intractable physical pain (*Meeting of the Psychiatric Section of the Royal Society of Medicine*, April 9th, 1946).

Several points emerge from this conception of the desired result of leucotomy.

Firstly, as to the lessening or dulling of emotion—we have no measure of the extent to which it may be expected to occur, nor is there any agreement as to whether the dulling is temporary or permanent. Sometimes it does not seem to occur at all.

Secondly, though the preoccupation with self may be lessened, we are as yet without certainty as to whether the *normal* consciousness of self is interfered with by leucotomy, and, if interfered with, to what extent. This question is bound up with the whole problem of possible post-leucotomy changes of personality which are discussed later (page 19).

The resumption of everyday activities is the third point to mention here—that in itself is beneficial and may contribute a great deal to the result. Thus, re-education or rehabilitation of the patient after operation is very important. One contributor to this series of cases discharges his patients as early as three weeks after operation so that they may be influenced by their normal home surroundings. Others stress the importance of post-operative psycho-therapy and re-education within the hospital.

Origin and technique.—The originator of leucotomy was Egas Moniz who introduced it in Lisbon in 1935 : reference must also be made to the work of Freeman and Watts who operated on a long series of cases in America. Since then much work has been done and many papers on the subject have appeared in this country and elsewhere.

The approach to the brain is through a trephine hole in the skull made under local or general anaesthesia. Through the opening an instrument is introduced and moved so that its free edge or loop cuts the white matter. There are various methods of operating. In analysing the present series of cases no distinction of method has been made owing to lack of information. The operation may be unilateral or bilateral—in the great majority of cases it was bilateral. Right and left sides of the brain can both be dealt with at one session or they may be treated on different occasions.

Risks.—Under operative risks is included the possibility of death from haemorrhage immediately or later, or from a complication (page 24) ; there is also the possibility of the occurrence of epileptiform fits (page 19) and of other post-operative symptoms or changes of personality (page 19).

For technical reasons which need not be discussed here, the surgeon cannot always be sure of cutting the fronto-thalamic fibres. A. Meyer quoted a remarkable case in a paper read before the Royal Medico-Psychological Association (*Jl. Ment. Sc.*, 1945, xci, 411). It was that of a schizophrenic of five years' standing whose operation was regarded as "a great success." He became "unworried and happy" so that it was a "pleasure to see him." He died eighteen months later from carcinoma of the oesophagus and it was found post-mortem that the cut in the brain had not severed the fronto-thalamic connections and that degeneration of the nucleus medialis dorsalis had not

taken place, in other words, pre-frontal leucotomy as ordinarily understood had not been achieved. We have referred to this case because it shows that as yet the operation rests on an empirical rather than on a strictly anatomical basis. Nevertheless one must agree with Meyer when he says "Even if it should be proved that damage *anywhere* in the brain might have a beneficial effect in a number of cases, it would be difficult to conceive of a theoretically and practically more rational place for the operation than Moniz has suggested."

THE QUESTIONNAIRE ISSUED BY THE BOARD

The headings and covering letter were as shown below :

Patients treated up to the end of the year 1944		Date of admission	Age		Duration of present attack (In years and twelfths of a year)	Diagnosis
Names	Sex		On present admission	On first attack		
(1)	(2)	(3)	(4)	(5)	(6)	(7)

MENTAL CONDITION

Date of Leucotomy	Before Leucotomy (Briefly)	Three months or more after Leucotomy (State period)
(8)	(9)	(10)

N.B.—The following symbols should be used to indicate mental condition in columns (11), (12) and (13) :—

R = Recovered. + = Improved. O = No change. W = Worse.

RESULT (see symbols above)					REMARKS
Still on books		Discharged (if transferred add "T")	Died		
In residence	On trial		Date of death	Cause of death (if from the operation add "X")	
(11)	(12)	(13)	(14)	(15)	(16)

The following letter was issued with the forms :

In view of the increasing extent to which pre-frontal leucotomy is being practised in mental hospitals, the Board of Control feel that the time has come when the results of this operation ought to be collated and examined. They recognize that the great pressure under which the depleted medical staffs of many hospitals are now working has made it difficult if not impossible to carry out any systematic follow-up of leucotomy cases. They feel sure, however, that in view of the importance of the inquiry they can count on the co-operation of all medical superintendents who have had any experience of this form of treatment, and they have accordingly prepared a questionnaire which, though at first sight it may appear somewhat elaborate, can in fact be filled up from records of the hospitals without the necessity for any domiciliary visits or other special inquiries. A return of this character inevitably omits much that in normal circumstances it would have been

desirable to ascertain. The Board fully recognize the limitations which war conditions impose, but they are satisfied that a return in broad outline will furnish valuable data and may point the way to a more intensive study at a later stage when working conditions are more favourable. They therefore hope that all hospitals in which leucotomies have been performed will help them by filling up the questionnaire.

If this treatment has not been carried out in your hospital, it is requested that the form may be returned with a note to that effect.

Omissions from Questionnaire.—Because of the war-time conditions which have been mentioned it was necessary to make this questionnaire as easy to answer as possible: much briefer than it would have been if there had been ample time and staff to deal with it in the hospitals. One simplification was to frame some of the questions so that they could be answered by reference to the Medical Register. We think that there might have been very few returns if the document had been more elaborate. Details which might be useful in study of leucotomy in the future are mentioned in the Appendix (page 23).

STATISTICAL RESULTS

General.—The investigation covered 1,000 patients: 348 males and 652 females. The main results are shown in the following table.

TABLE 1—MAIN RESULTS

	A % of total cases treated	B Relapses % of No. in corresponding group in A
Discharged	... { Recovered ... 24.8 Improved ... 10.5 No change ... 0.6	9.3 (i.e., 3.3% of total treated)
Still in hospital	... { Improved ... 32.3 No change ... 24.8 Worse ... 1.0	3.7 (i.e., 1.2% of total treated)
Deaths*	... { Due to treatment ... 3.0 Not due to treatment ... 3.0	—

* For causes of death see page 24.

RESULTS ACCORDING TO FORM OF MENTAL DISORDER

Nearly sixty different terms were used in the returns under the heading of diagnosis. Only the broadest grouping of these proved to be practical for statistical purposes; the classification being as follows:—Schizophrenia; manic-depressive insanity; delusional insanity; neurosis (*a*) obsessional, (*b*) other; post-encephalitic states; mental defect; epilepsy; various.

Schizophrenia (599 cases).—In this group we have included cases diagnosed as dementia praecox, primary dementia, schizophrenia, schizophrenic reaction types; catatonia, hebephrenia, paraphrenia. We should have liked to extract and consider separately the hebephrenic and the catatonic in order that their response to treatment might be studied, but the nomenclature and description of cases varied so widely that we were unable to do so.

Manic-depressive insanity (250 cases).—Under this heading we have put those reported to suffer from mania, melancholia, cyclothymia, manic-depressive insanity, depressive reaction, agitated melancholia, involutional melancholia, affective psychosis and the like. Involutional melancholia was not extracted as a separate group. Some cases were indeed labelled as "involutional" but there were many other old or elderly patients diagnosed simply as "melancholia" or "depression." Without the doctors who made the returns at

hand to advise us we could not know which of these were regarded as involutional and which were not.

Schizophrenia and manic-depressive insanity account between them for 85 per cent. of the total treated.

Delusional insanity (25 cases).—Here were included those with paranoia and those diagnosed as having delusional insanity.

Neurosis (34 cases).—These were classed as (a) obsessional, (b) other neurosis; because it had been said that obsessional cases responded particularly well to leucotomy, and though our numbers were small we wished to see how far they supported that belief.

Post-encephalitic (5 cases), *mental defect* (6 cases), *epilepsy* (18 cases).—Operation in these was performed in the hope of ameliorating the serious symptoms shown, such as violence, destructiveness, depression and so on. Where improvement or recovery is recorded it was these symptoms which showed the significant response—not the basic condition.

Various (63 cases).—Some of these were mixed cases (42) showing the symptoms of more than one type of mental disorder and leaving us unable to classify them in any but the present group. The remainder (21) were a miscellaneous collection of other diagnoses not justifying separate classification.

Results according to diagnosis are shown in the table below.

TABLE 2—RESULTS ACCORDING TO DIAGNOSIS
Percentages (of cases treated) are shown in brackets.

Diagnosis	Number treated	Died	Discharged (Including relapsed cases)			In Hospital (Including relapsed cases)			Relapsed	
			Recovered	Improved	No change	Improved	No change	Worse	After discharge	After improvement in hospital
Schizophrenia	599	28 (4·7)	97 (16·2)	59 (9·8)	4 (0·7)	217 (36·2)	188 (31·4)	6 (1·0)	18 (a)	8 (b)
Manic-depressive	250	21 (8·4)	112 (44·8)	21 (8·4)	—	63 (25·2)	32 (12·8)	1 (0·4)	8 (a)	2 (b)
Delusional ...	25	2	5	3	1	9	5	—	—	—
Neurosis : (a) Obsessional	29	2	17	6	—	3	1	—	3	—
(b) Other ...	5	—	2	2	—	—	—	1	—	—
Post Encephalitic ...	5	—	—	—	—	5	—	—	—	—
Mental Defect	6	—	—	3	—	1	2	—	1	1
Epilepsy ...	18	4	—	1	—	10	3	—	—	—
Various ...	63	3	15	10	1	15	17	2	3	1
Total ...	1,000	60	248	105	6	323	248	10	33	12

(a) Percentage which relapsed of those discharged recovered or improved :
Schizophrenia 11·5 ; Manic-depressive 6·0

(b) Percentage which relapsed of those remaining in hospital improved :
Schizophrenia 3·7 ; Manic-depressive 3·2

TABLE 3—RESULTS ACCORDING TO SEX AND AGE

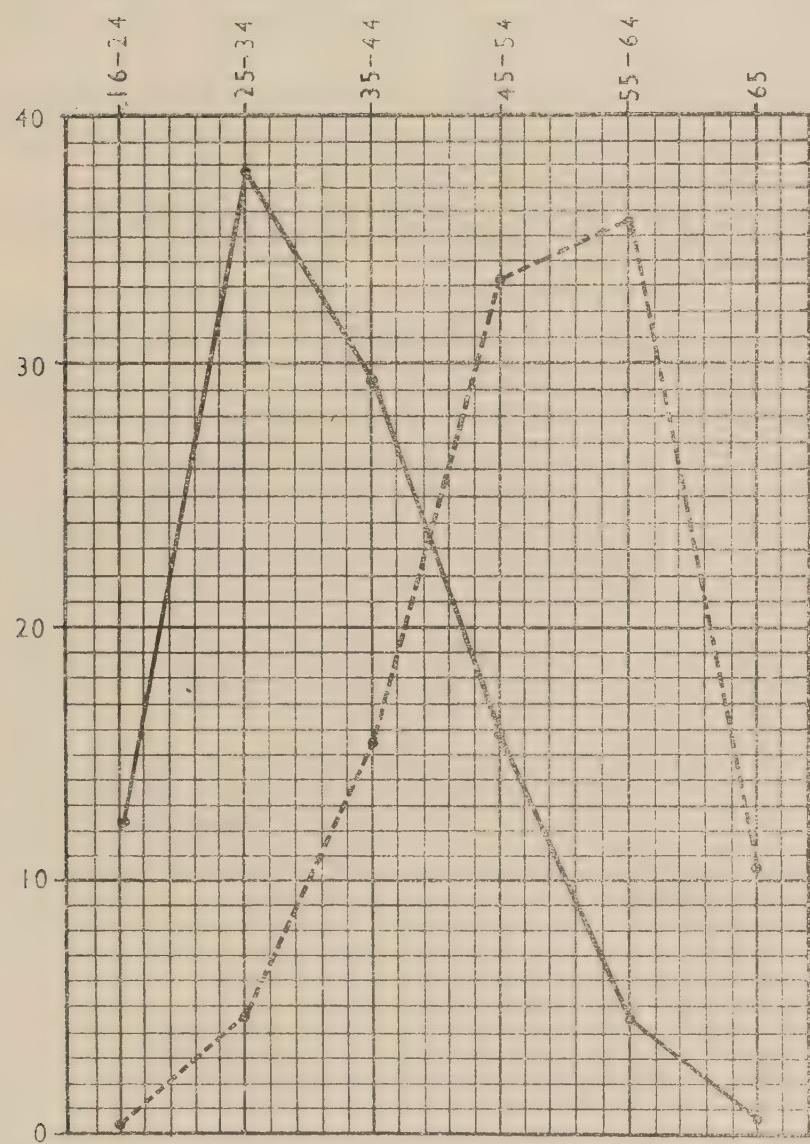
Age at Leucotomy	Number of patients treated	Discharged, Recovered or Improved, excluding known relapses			Remaining in Hospital Improved, excluding relapses		
		M.	F.	Number	Per cent.	M.	F.
16-24...	... 44	36	13	10	29.5	27.8	28.8
25-34...	... 109	155	29	45	26.6	29.0	28.0
35-44...	... 86	189	32	51	37.2	27.0	30.2
45-54...	... 56	161	24	43	42.9	26.7	30.9
55-64...	... 39	89	21	35	53.8	39.3	43.8
65-	... 14	22	6	11	42.9	50.0	47.2
Total	... 348	652	125	195	35.9	29.9	32.0

TABLE 4—SCHIZOPHRENIC AND MANIC-DEPRESSIVE CASES ONLY—Results according to sex and age.

Age at Leucotomy	No. of patients treated	Schizophrenia			Manic-depressive		
		% Discharged Recovered or Improved, excl. known Relapses	% Remaining in hospital Improved, excl. Relapses	No. of patients treated	% Discharged Recovered or Improved, excl. known Relapses	% Remaining in hospital Improved, excl. Relapses	No. of patients treated
16-24	... 42	31	28.6	25.8	23.8	12.9	1
25-34	... 96	129	24.0	27.9	37.5	32.6	2
35-44	... 57	118	31.6	21.2	38.6	34.7	8
45-54	... 25	70	28.0	10.0	28.0	47.1	22
55-64	... 7	21	28.6	—	42.9	42.9	26
65-	... 1	2	—	—	—	—	10
Total	... 228	371	27.2	20.5	34.2	35.3	69

AGE DISTRIBUTION (PER CENT.) OF CASES OF—

- (a) Schizophrenia
(b) Manic-depressive



RESULTS ACCORDING TO SEX AND AGE

From Table 3 it would appear that the results are better in males than in females. During the past five years the average general recovery rate in mental hospitals, expressed as a percentage of the direct admissions, has been for males, 29·8 ; for females, 36·0. But it does not seem reasonable to assume that there is a sex differentiation in the results of the operation. Was it perhaps easier to place men out in employment than it was to place women at the time when the records were compiled, so that proportionately more men than women were classed as recovered ? Did that or some other factors, e.g., selection, influence the figures ?

It may be noted that there is not a higher incidence of manic-depressive insanity among males treated, for male manic-depressives formed only 20 per cent. of males in the series compared with 28 per cent. in the case of women. It is of interest that in the report on Insulin Shock Therapy (*Study by the Temporary Commission on State Hospital Problems, New York, 1944*) it is stated that the *males* profited more than the females from insulin treatment both as to ability to leave the hospital and the level of usefulness they attained.

The table indicates also that the results are better in the older age-groups (55 and over) than in the younger. Here the type of mental disorder apparently is a factor, for there is a higher proportion of manic-depressive cases (with its 50 per cent. discharged recovered or improved, excluding relapses) in the older age-group.

The points mentioned above are further brought out by Table 4 and by the graph which follows it.

RESULTS ACCORDING TO DURATION OF MENTAL DISORDER

Congenital cases and those in which the duration of the attack was indefinite or not stated, numbering 49 in all, have been omitted from the following table. Patients whose present attack of mental disorder had persisted for less than two years formed one-fifth of the patients treated, but just over half of these patients both in the Manic-depressive and the Schizophrenic groups had a history of previous mental illness. It will be observed that it was found possible to discharge as recovered or improved 58 per cent. of them ; it is doubtful, however, whether any useful conclusions can be drawn from this as this group in any event provides the most fertile field for treatment.

TABLE 5—RESULTS ACCORDING TO DURATION OF MENTAL DISORDER

Duration of present attack up to leucotomy	No. of patients treated	Discharged Recovered or Improved excluding known Relapses					
		Number			Per cent.		
Years	M.	F.	T.	M.	F.	T.	
Under 1 ...	37	58	95	28	33	61	75·7 56·9 64·2
1+	38	61	99	18	33	51	47·4 54·1 51·5
2-4	82	207	289	27	59	86	32·9 28·5 29·8
5-9	105	165	270	23	35	58	21·9 21·2 21·5
10-19... ...	51	99	150	12	9	21	23·5 9·1 14·0
20-	13	35	48	2	6	8	15·4 17·1 16·7
Total ...	326	625	951	110	175	285	33·7 28·0 30·0

Results according to duration in the schizophrenic and manic-depressive groups are shown below. It is of interest to note how unfavourable to treatment from the point of view of eventual discharge from institutional care are the schizophrenics whose present attack of mental disorder has persisted for more than two years.

(1) *Schizophrenia*

Duration of present attack up to leucotomy	Number of patients treated			Discharged recovered or improved excluding known relapses			Remaining in hospital improved, excluding relapses		
				Per cent.			Per cent.		
Year	M.	F.	T.	M.	F.	T.	M.	F.	T.
Under 1 ...	24	17	41	62·5	47·1	56·1	8·3	17·6	12·2
1+ ...	21	22	43	42·9	54·5	48·8	23·8	22·7	23·3
2-4 ...	52	120	172	26·9	17·5	20·3	30·8	32·5	32·0
5-9 ...	71	104	175	15·5	15·4	15·4	50·7	37·5	42·9
10-19 ...	41	69	110	17·1	4·3	9·1	41·5	47·8	45·5
20- ...	9	23	32	—	13·0	9·4	11·1	47·8	37·5
Total ...	218	355	573	25·7	17·7	20·8	35·3	36·6	36·1

(2) *Manic-depressive*

Under 1 ...	10	29	39	100·0	65·5	74·4	—	20·7	15·4
1+ ...	12	29	41	66·7	55·2	58·5	—	31·0	22·0
2-4 ...	21	57	78	42·9	49·1	47·4	19·0	26·3	24·4
5-9 ...	11	37	48	36·4	29·7	31·3	27·3	32·4	31·3
10-19 ...	4	16	20	25·0	12·5	15·0	75·0	37·5	45·0
20- ...	2	2	4	100·0	—	50·0	—	100·0	50·0
Total ...	60	170	230	56·7	44·7	47·8	16·7	29·4	26·1

NOTE ON SEVERITY OF CASES IN THE SERIES

Our cases are a selected group for naturally those chosen to undergo leucotomy would be the more serious cases. This is borne out by the frequent appearance of phrases in the returns, such as "a very difficult case," "prognosis hopeless," "one of the worst cases in the hospital," "degraded, destructive and dangerous," and the like. They are moreover patients who for the most part have already been treated by other methods without lasting success. We have been given some information on this point in the returns but unfortunately it is not in a form which can be summarized here. Nevertheless, we have no doubt that the great majority of cases in our series were both severe and also resistant to other treatment. This has to be kept in mind when any comparison is made with the results of treatment of any series of cases by E.C.T., insulin, etc.

CLINICAL RESULTS

General.—We have in this section analysed the information given in the returns under the headings—Mental condition before leucotomy, Mental condition after leucotomy, Remarks.

The analysis has been set out in various ways, referring to :

- (a) Social behaviour (dead, worse, as before, milder, co-operative, citizen).
- (b) Particular forms of behaviour (violence, difficult behaviour, habit of work).
- (c) Symptoms as a whole.
- (d) Particular symptoms (delusion, hallucination, depression, apparent suicidal intent, agitation, excitement, obsession).
- (e) Epileptiform fits.
- (f) Some interesting points noted.
- (g) The question of personality change.

It must be made clear that we have by no means fully analysed every case, because there was not full information on each. In any one record submitted to us there might be a great deal of detail or only a few words.

It may be objected that such varied returns cannot be adequately analysed, but we were unwilling to file unused hundreds of careful clinical observations which were sent to us ; we have tried to compare and classify whatever information lent itself to such treatment.

As an example of factors not analysed we may cite *intelligence*. We could get no evidence to compare with the findings of other workers that intelligence as such is not impaired by leucotomy, for there are only one or two references to it throughout our whole series.

(a) SOCIAL BEHAVIOUR

The first analysis is an attempt to discover the post-operative capacity or behaviour of the patients and to group the cases as dead, worse, as before, milder, co-operative, or citizen.

There is some apparent discrepancy between the results in this section and those in the statistical section. The reason is that the information has been extracted from different parts of the returns and has moreover been considered from a different point of view in the two sections. The statistical section is based upon the ultimate *classification* made by the hospitals and the details for the most part simply summarized under the various headings. The clinical section is based upon the *descriptions* of the cases given by the hospitals and the information has been studied in order to see its clinical meaning.

An example may make this clear. In the statistical section the 60 deaths which occurred have been reckoned as deaths due or not due to the operation. But in the clinical section they have been considered individually. What was the state of the patient before he died ? Was it possible to come to any conclusion about the results of the operation, apart from the fact that the patient had died some time thereafter ? One patient was in fact said to be "worse" following the operation and to have remained so until her death nine months after operation—that case was added (in Table 6) to the number of those

reported as "worse." Another was discharged recovered and was earning his living for a year before he died of heart failure ; he was added to those classed as "citizen." In 18 of the 60 cases who died there was enough information to enable us to classify each in some other way than merely as dead. Other discrepancies are explained below (under "As before, milder, etc.").

Dead.—Of 30 patients who died from operation 19 died from haemorrhage. For further details of causes of death, see Appendix (page 24).

Worse.—Except that one case has been added as explained above, this group corresponds with the class of "worse" in the statistical section. For details see Appendix (page 25).

As before, milder, co-operative, citizen.—This is not, as might be supposed, a mere re-statement of the statistical groupings of no change, improved, and recovered, under different names. Certainly *where we have no detailed information* there is a simple re-grouping (as shown under (a) below), for we have had there to assume that the questionnaire classification of results would correspond broadly with a behaviour grouping.

But where we have detailed information we have disregarded the hospitals' ultimate classification and have in this clinical section grouped these cases (as shown in (b) below) upon what was said of their symptoms or behaviour.

This enables us to view the effect of treatment from a different angle. All cases who before operation were hallucinated, deluded, noisy and violent and after operation were still in hospital, still deluded and hallucinated, but quieter and more amenable will fall into our clinical grouping of "milder." (Some of these cases will have been put by their hospitals in the "no change" class because they are as insane as ever ; others will have been classed by different hospitals as "improved" because they behave better.)

Our groupings therefore are as follows :—

(a) Where there is no detailed information.	(b) Where detail is given.
<i>As before.</i> —Cases classed in returns as "no change."	Cases where no alteration in symptoms or behaviour is recorded.
<i>Milder.</i> —Those classed in returns as in hospital, improved.	Those whose behaviour was reported to be better or whose psychosis was less severe. (It was not possible to make a strict separation between behaviour and psychotic symptoms in many cases).
<i>Co-operative.</i> —Those discharged improved.	Those reported to be co-operative, actively helpful, helping in business, and the like, whether in or out of hospital.
<i>Citizen.</i> —Those discharged recovered.	Patients earning their living, managing their homes, or in other ways apparently being as "citizens"—(some of these appear in the statistical section as discharged recovered, and others as discharged improved).

In practice no hard and fast line could be drawn between (a) and (b) and each case was considered on its merits and grouped according to the best information available to us.

TABLE 6—SOCIAL BEHAVIOUR (AFTER OPERATION)

Diagnosis	Dead	Worse	As before	Milder	Co-operative	Citizen	Total
Schizophrenia	20	6	176	203	101	93	599
Manic-depressive	15	2	36	52	37	108	250
Obsessional	1	—	5	2	5	16	29
All other conditions	6	3	27	38	23	25	122
Total ...	42*	11	244	295	166	242	1,000

* Eighteen additional cases who died at some subsequent date are grouped here in one or other of the remaining categories in this table (see page 15).

Frequently in the returns patients were said to have become quieter, more amenable, or easier to nurse. The kind of change which occurred in their behaviour will be seen from the analysis which follows.

(b) PARTICULAR FORMS OF BEHAVIOUR (VIOLENCE, DIFFICULT BEHAVIOUR, HABIT OF WORK)

This is an estimate of the effect of operation in that proportion of cases which showed these forms of behaviour, according to our returns. By no means, of course, the whole thousand, for not all showed (for instance) violence. Moreover among the many recorded as being violent before the operation, there were some who were said to have improved without any remark being made as to whether they were still violent, less violent, or not violent, after the operation. We could only analyse cases where we had some indication as to how the particular symptoms had been affected.

Violence (364 cases).—These were patients in whose records we find such words as dangerous, violent, aggressive (unless evidently only in speech), impulsive, hits out, attacks others, etc.

Difficult behaviour (175 cases).—These cases were reported to be dirty, destructive, of bad habits, kept in seclusion, tube-fed and the like. They are those who appear to put a *particular* burden upon the hospitals.

Habit of work (115 cases).—Of the 631 cases who were reported as recovered or improved, there were only 115 about whom we had relevant information as to habit of work *both before and after* operation. In large numbers of others there were phrases such as "at work," "usefully employed," "occupied in handicrafts," etc., etc., after operation—information which we could not use because nothing had been said about idleness or occupation before. We give the small numbers for what they are worth.

TABLE 7—PARTICULAR FORMS OF BEHAVIOUR (AFTER OPERATION)

Diagnosis	Violence (364)				Difficult behaviour (175)				Habit of work (115)		
	Worse	Prominent	Less	Gone	Worse	Prominent	Less	Gone	Unchanged	Gained	Lost
Schizophrenia ...	2	84	70	128	—	51	18	52	15	52	1
Manic-depressive ...	1	4	1	15	1	4	2	24	—	22	—
Obsessional... ...	—	—	—	—	—	—	—	—	1	5	—
All other conditions	—	13	18	28	—	9	3	11	3	16	—
Total	3	101	89	171	1	64	23	87	19	95	1

(c) SYMPTOMS AS A WHOLE

Notes on a great variety of symptoms of all kinds were scattered throughout the records. They could not all be analysed separately, so we have considered them first in a general way as below.

TABLE 8—SYMPTOMS AS A WHOLE (AFTER OPERATION)
(Per cent. of cases treated in brackets)

Diagnosis	Symptoms				Total cases
	Worse	Prominent	Less	Gone	
Schizophrenia	6 (1·0)	260 (44·9)	228 (39·4)	85 (14·7)	579
Manic-depressive ...	2 (0·8)	44 (18·7)	85 (36·2)	104 (44·3)	235
Obsessional	—	6 (21·4)	12 (42·9)	10 (35·7)	28
All other conditions ...	3 (2·6)	40 (34·5)	52 (44·8)	21 (18·1)	116
Total	11 (1·1)	350 (36·5)	377 (39·4)	220 (23·0)	958*

* Excluding 42 in whom, so far as we could judge from the returns, no result was established before death.

(d) PARTICULAR SYMPTOMS (DELUSION, HALLUCINATION, DEPRESSION, APPARENT SUICIDAL INTENT, AGITATION, EXCITEMENT, OBSESSION)

In making this grouping we were again restricted to cases in which information before operation was comparable with that after operation. Here also we are trying to make the best of a necessarily incomplete war-time record of cases.

TABLE 9—PARTICULAR SYMPTOMS (AFTER OPERATION)

SYMPOMS

There is from the above table and the bar diagram which follows a striking difference between disorders of thought (delusion and hallucination), which were not greatly influenced by the operation, and disorders of emotion (particularly depression and agitation) which were much more often lessened or abolished.

(e) POST-LEUCOTOMY EPILEPTIFORM FITS

Fits were recorded in 33 cases including 4 doubtful instances, i.e., 3.3 per cent. of the total number of patients treated.

Doubtful ...	...	...	...	...	...	...	...	4
Petit mal ...	...	...	...	...	...	...	...	1
Only 1 fit reported	...	...	...	...	...	...	...	5
More than 1 fit reported	...	...	...	...	...	...	...	21
Status epilepticus	...	...	...	...	...	...	...	2

Further details of the cases are given in the Appendix (page 26).

(f) SOME INTERESTING POINTS NOTED AFTER OPERATION

One patient developed obsessional behaviour (handwashing). One had 4 E.C.T. fits following operation and thereafter became homicidal. Two became gluttonous. One developed asthma. Psoriasis cleared in one case (no further details given). One was completely confused for two months after operation but this cleared up dramatically with nicotinic acid. Four had married since or were about to be married.

(g) THE QUESTION OF POST-OPERATIVE PERSONALITY CHANGE

We had hoped that our survey would have thrown light on a most important question—that of possible changes in personality following leucotomy. Some reference has already been made to this (page 6).

The basic facts which are wanted are these :—

Does leucotomy restore the pre-psychotic personality ?

Does it impair the personality and, if so, in what way ?

If there is a change, is it temporary or permanent ?

It is very difficult to find any answer to these questions. Take, for instance, a statement which is sometimes made that leucotomy renders the patient dull and destroys his initiative ; and suppose that we wish to test its truth in a man of 28 who had been a schizophrenic in hospital for six years before operation and has now come home improved but "dull and without initiative." His dullness may be the direct result of the operation or it may be a symptom of schizophrenia remaining unrelieved by the operation, or the dullness may be the normal reaction of a man now older, returning to a family changed by time, to different conditions of living, and missing friends and acquaintances who may have gone away or forgotten him.

Only a full and careful inquiry as to the character and behaviour of the patient before he became ill and his character and behaviour after his operation would give us any clue ; then there is the fact that the reaction of the patient may change and often does change as he adjusts himself again to the outside world. Inquiry would have to be made at intervals over some years.

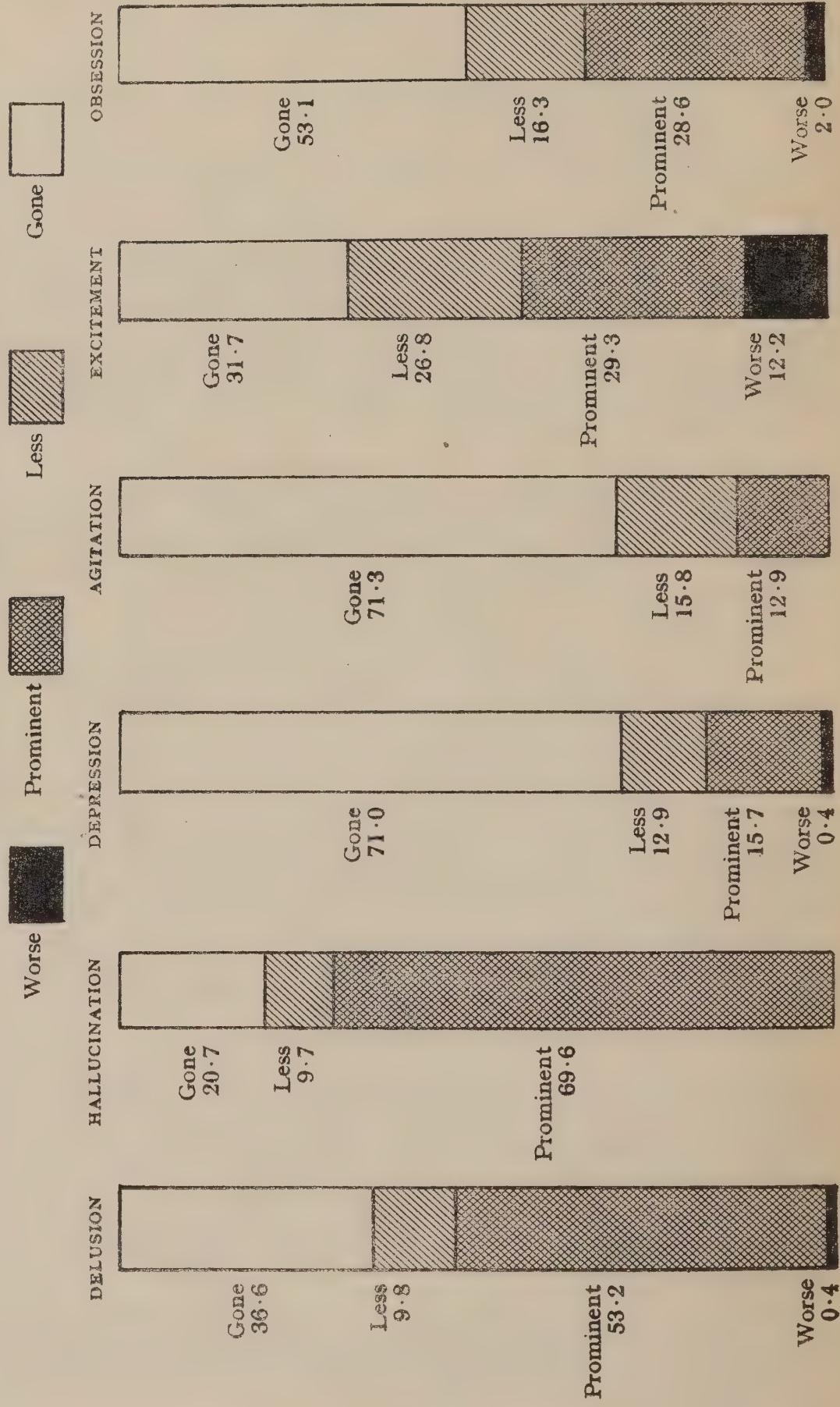
Before any assessment of personality could be made it would be necessary to define "personality," as has been pointed out (Hutton, E. L. (1945), *Jl. Ment. Sc.*, xci, 383).

In this present survey we have not attempted to select any definition from among the many that have been made, still less to make a new one. There is nothing in our material which leads us to any clear conclusion about personality change.

EFFECT OF LEUCOTOMY ON PARTICULAR SYMPTOMS

Calculation based on all instances of the particular symptoms which were available for study (see text)

Result shown as percentage of total instances of each symptom which after operation were:



DELUSION. 235 Instances.
Symptom gone in only
36.6%

HALLUCINATION. 217
Instances. Symptom
gone in only 20.7%
Worse in none.

DEPRESSION. 217 In-
stances.
AGITATION. 101 Instances.
Symptom gone in 71%
in each.

EXCITEMENT 41 In-
stances. Symptom
worse in 12.2%. The
total number of in-
stances of excitement
studied was small and
most of the "Worse"
cases were reported by
one hospital.

OBSSESSION. 49 Instances.
Of these, 27 were in
patients diagnosed Ob-
sessional Neurosis.
Symptom worse in 2%
represents 1 case of de-
lusionary insanity who
developed obsessional
symptoms after opera-
tion.

APPARENT SUICIDAL
INTENT.
74 Instances. (Scale 1/ $\frac{1}{2}$
of other columns.)

Gone 84%
Still present 16%

Worse 2.0%

Certainly we get from the records a general impression of a lessening of emotional tension. "Delusions persist, but he does not worry"; "less influenced by delusions"; "more indifferent to delusions and hallucinations"; "appears hallucinated but takes no notice of voices"; "depressive ideas persist but without same tension"; "says 'I don't feel so agitated about it as I should'"; "depersonalization persists but less vivid"—these are some of the statements made and there are many others of the same kind. Just over 30 patients were described as lacking in initiative or spontaneity, and a number were called dull, slow, inert, docile, submissive and the like, after operation. But others are described as happy, cheerful, completely carefree, confident and content; one is said to be "very merry and bright, leads a normal gay social life," and others are said to have made "an absolute recovery" or "an apparently complete and permanent recovery." Of one patient it was reported that she was working very well in highly skilled clerical and administrative work—relations, who were doctors, saying that they could find nothing wrong with her; of another that he had no symptoms and was working as manager of a rather large business.

In fact it would be possible to select from the reports a series of extracts purporting to prove almost anything about the effect of leucotomy upon personality. Looking at the whole we are bound to admit that the mesh of our inquiry has been too coarse to catch the fine qualities of personality which may make all the difference to a man's inner life and to his influence on society. We have in this survey to content ourselves with broad generalizations.

SUMMARY AND CONCLUSIONS

Reports of 1,000 cases treated by pre-frontal leucotomy in mental hospitals, registered hospitals and licensed houses have been studied and the general results are presented.

SUMMARY

1. Patients discharged recovered were 24.8 per cent. \setminus 35.3 per cent. of cases
Patients discharged improved were 10.5 per cent. \int treated.
Of the numbers in these two groups together 9.3 per cent. relapsed
2. Remained in hospital improved—32.3 per cent.
Of these, 3.7 per cent. relapsed.
3. Remaining in hospital unchanged were 24.8 per cent.
4. Worse following the operation were 1.0 per cent.
5. Deaths were 6.0 per cent. of cases treated.

Half of these were attributed to the operation; in these 30 cases the outstanding cause of death was haemorrhage (19 cases).

6. The total incidence of fits as reported following operation was 33, or 3.3 per cent.; but perhaps the significant figure is that of 21 cases who had more than one fit, an incidence for the series of 2.1 per cent.
7. The schizophrenic group formed 60 per cent. of the total treated and in this group there was a discharge rate (recovered or improved) of 23.0 per cent., excluding relapsed cases.
8. The manic-depressive group accounted for 25 per cent. of cases treated, with a discharge rate of 50 per cent., excluding relapsed cases.
9. There was an apparent sex differentiation in favour of males in respect of patients reported as recovered or improved: M. 65.2 per cent., F. 62.0 per cent. For those *discharged* as recovered or improved the percentages were: M. 35.9, F. 29.9.

10. Results according to age showed that the older age-group (55 and over) had the best discharge rate; the form of mental disorder apparently is a factor in this connexion as there is a higher proportion of manic-depressive cases in this age-group.
11. Results according to duration of mental disorder showed that patients whose present attack had persisted for less than 2 years formed one-fifth of the patients treated and it was found possible to discharge as recovered or improved 58 per cent. of them.
12. Social behaviour was analysed in the cases of 958 patients, i.e., all surviving patients plus 18 who died sufficiently long after operation for some estimate of result to be made first.

As before, 244. Milder in behaviour or psychosis, 295. Co-operative, 166. Living as citizens, 242. Worse, 11.

13. Particular forms of behaviour were analysed in those cases in which some relevant information about the behaviour in question was given both before and after operation.

After operation :	Worse	Prominent	Less	Gone
Violence (364 cases)	... ...	3	101	89
Difficult behaviour (175)	... ...	1	64	23
Habit of work (115)	Lost 1.	Unchanged 19.	Gained 95.	

14. Analysis of symptoms as a whole was made in 958 cases.

After operation : Worse 11 (1.1 per cent.). Prominent 350 (36.5 per cent.). Less 377 (39.4 per cent.). Gone 220 (23.0 per cent.).

15. Analysis of certain symptoms was also made.

After operation	Worse	Prominent	Less	Gone
Delusion (235 cases)	1 (0.4%)	125 (52.2%)	23 (9.8%)	86 (36.6%)
Hallucination (217)	—	151 (69.6%)	21 (9.7%)	45 (20.7%)
Depression (217)	1 (0.4%)	34 (15.7%)	28 (12.9%)	154 (71.0%)
Agitation (101)	—	13 (12.9%)	16 (15.8%)	72 (71.3%)
Excitement (41)	5 (12.2%)	12 (29.3%)	11 (26.8%)	13 (31.7%)
Obsession (49)	1 (2.0%)	14 (28.6%)	8 (16.3%)	26 (53.1%)

Apparent suicidal intent (74) :—Still present 12 (16.2%); Gone 62 (83.8%).

16. The effect of leucotomy upon personality cannot be deduced from the present survey.
17. The findings given above are discussed in the text and illustrative details are given in the Appendix.

CONCLUSIONS

Pre-frontal leucotomy is usually a simple operation for the patient, if not always easy for the surgeon. Complications are infrequent and the death rate cannot be said to be high when the seriousness of established mental disorder is taken into account.

Remarkable improvement in behaviour follows in a large percentage of cases who have had severe symptoms with poor prognosis and have failed to respond to other methods of treatment. Many are discharged from hospital and others, while unfit to leave, become much more placid and easier to nurse.

The question as to whether or no these results are achieved at the cost of the loss of some finer mental qualities is not yet answered and further study is needed on this most important point.

We are of opinion that the operation should be carried out only after careful consideration of each individual case by experienced psychiatrists.

APPENDIX

A. Details which might be useful in future study.

Selection of cases.—The exact basis on which cases were selected ; their prognosis without operation ; the kinds of treatment which had been tried before operation, and their effect. (We have referred to the selection of cases in our series but our opinion was based on the general information given about them. No specific questions were put on the point.)

The Operation.—Choice of anæsthetic (local or general). Site and extent of operation. Whether unilateral or bilateral. Whether at one session or two. Method of operation and verification of anatomical result.

Mental powers.—Intelligence, memory, power of concentration and any other chosen qualities before and after operation. Particular attention might be paid to sense of mental tension or urgency.

Frontal lobe symptoms.—The presence or absence after operation of specific symptoms commonly associated with frontal lobe injury, such as irritability, lack of initiative, "Witzelsucht" and others.

Personality.—Possible changes of personality, comparing the personality after operation both with the psychotic and the pre-psychotic personality. The nature of the changes, their persistence or otherwise.

Bodily changes after operation.—Their nature and duration.

Fits.—Their number, severity and interval of occurrence after operation.

Treatment after operation.—The nature and effect of treatment tried, in particular re-education and rehabilitation.

Relapse.—Interval between operation and relapse and, if patient discharged, between discharge and relapse. Effect of insulin or other physical method of treatment after operation in cases showing signs of relapsing.

Follow-up inquiry.—Careful inquiry at specified intervals after operation—say, 6 months, 1 year, 2 years and 5 years—should give a useful check on first results. With reference to interval between operation and report, it may here be noted that in our series there were but few cases in which the interval was as short as three months ; in many cases it was a year or more. Not all hospitals stated the interval.

Definition of terms.—Results in any series would be more accurate if all hospitals whose cases were included used the terms "no change," "improvement" and "recovery" in the same sense. Definitions might be set out in any future inquiry ; they were not given in our questionnaire in order to avoid complicating the work of hospitals already using their own criteria and classifications.

Comparability of notes.—To make comparison easy reports after operation should refer specifically to points mentioned in reports before operation. A pre-arranged scheme might be used to give some uniformity of method in different hospitals. In the present survey much unclassifiable detail was given to us which might have been omitted if a planned method of reporting could have been adopted.

Work in hand.—Investigations on a number of the points mentioned above have been carried out or are now being undertaken independently in individual hospitals.

B. Causes of Death

The causes of death are shown below.

1. Those attributed to operation (30)

Intracranial hæmorrhage	...	19	In one of these cases there was also pneumonia; in another, tuberculosis. In two an artery was said to have been cut. In one case "cerebral softening followed post-operative hæmorrhage, the basal ganglia injured; the patient was almost microcephalic." In another the hæmorrhage was reactionary.
Broncho-pneumonia	...	4	
Meningitis	...	3	
Cerebral abscess	...	1	
Respiratory failure	...	1	
Subdural hæmatoma with abscess of lung	...	1	
Empyema	...	1	

2. Those not attributed to operation (30)

Pneumonia or broncho-pneumonia	7	One of these had epileptiform seizures, one had pulmonary abscess, and one had empyema.
Pulmonary tuberculosis	4	
Coronary thrombosis	2	
Cardiac trouble	1	Exact cause not known at hospital—patient died elsewhere
Cardiac degeneration	1	
Cardio vascular degeneration	1	
Cerebral hæmorrhage	1	Thirteen months after operation
Hyperpiesis and seizures	1	Hyperpiesis 8 years' duration
Status epilepticus	2	Both patients were epileptics
Chronic nephritis	1	
Cysto-pyelitis and enlarged prostate	1	
Septicaemia	2	One of these had bullous dermatitis
Carcinoma oesophagus	1	
Suicide	2	Frontal tumour in one of these
Exposure	1	
Aspirin overdose	1	Patient had been an aspirin addict
Cause not known	1	Patient died elsewhere than in the hospital making report

C. "Worse" cases.

The changes in the eleven cases reported as worse following leucotomy are shown below. The list includes one who died later (see page 14).

Case No.	Diagnosis	Before	After
2 M	Schizophrenia	Halluc., sly, cunning, violent, attacking, suicide attempts.	Very impulsive and suicidal. Puts head and hands through windows and requires constant observation (18 months).
67 F	Melancholia	Dep., agit., apprehensive. Suicidal caution.	Excited, noisy, abusive, destructive, Dep. remained after 1st. op.; 2nd performed apparently too extensively.
169 M	Anxiety Neurosis	Anxiety over trifles. Lack of confidence.	Restless, at times confused. No anxiety, but repeats action without reason. Has started to have epileptic fits.
183 F	Chronic Melancholia	Dull, dep., noisy, lachrymose—much supervision.	Definitely worse mentally following op. Up to all sorts of nonsense, simple, limited, stupid, totally dependent. Op. 10.2.44. Died 10.11.44. Lobar pneumonia.
200 F	Manic Recurrent	Outburst of angry mania.	No outbursts, fairly cheerful, fatuous and childish. Hemiplegic, incontinent, post op. cerebral haemorrhage; mental condition improved, physical condition worse, habits deteriorated.
444 F	Organic Dementia	Depressed, restless, sleepless.	After six months dirty, gluttonous, noisy. Obvious intellectual deterioration.
481 M	Catatonic Schizophrenia	Neg., semi-stuporose, occasionally impulsive. Some response to E.C.T.	Completely lost, stuporose. Habits faulty. Will not respond to E.C.T.
715 F	Paranoid reaction	Halluc., violent, noisy. Dull, faulty, untidy, restless.	Demented. Irrational. Vague delusions Attacks patients and staff. 14 E.C.T.s following operation.
769 F	Schizophrenia	Solitary, suspicious. Thinks food is poisoned. Blockage of thought. Non-co-operative. Thought of death.	Very restless. Depressed. Very suicidal. Hallucinated. Ideas of influence.
954 F	Schizophrenia	Impulsive, resistive. Mute, catatonic.	No improvement.*
986 F	Schizophrenia	Stuporose, catatonic, impulsive.	Worse.†

* Details not given except for the two words quoted, but case was shown in column of results as "worse."

† Details not given.

D. Post-leucotomy epileptiform fits.

A classification of cases in relation to number of fits has been made in the text (page 19).

Some further details are shown in the table below.

Type of fit	Interval after operation before onset of fits.						Total
	Not stated	"Post operative"	— 6 months	— 1 year	— 2 years	2 years and over	
Doubtful ...	3	—	1	—	—	—	4
Petit mal ...	1	—	—	—	—	—	1
1 fit ...	1	—	2	—	1	1	5
2 or more ...	7	4	5	2	2	1	21
Status epilepticus	—	—	2	—	—	—	2
Total	12	4	10	2	3	2	33

In 7 cases E.C.T. had been given, but in most cases it was not stated whether or no any convulsion treatment had been given before the development of epileptiform fits.

In one case which had status epilepticus 5 months after operation and again 8 months after, no convulsion treatment had been given.

E. Illustrative cases

These have been taken almost at random from the records. With so many factors, it is not possible to make a *typical* selection of a very few cases out of so many. They are given mainly to show the kind and variety of information on which the results were based.

(1) IN HOSPITAL IMPROVED (6 CASES)

No. 10. F. Schizophrenia. Duration 10 years

Before : A well established case of hebephrenia with marked behaviour disorder and sudden wild impulsive outbursts attacking viciously anyone in her vicinity. A good laundry worker but owing to her anti-social behaviour she proved too dangerous for further work in the laundry.

After : Report made $2\frac{3}{4}$ years after leucotomy. Complete change as regards conduct. Now quiet, docile, with not a single impulsive outburst since operation. Housed in an open ward, useful and regular laundry worker, attends church, entertainments and cinema in the town. Still blunted emotionally and lacks initiative. Friendly but "distant."

No. 28. M. Agitated Melancholia. Duration 3 years

Before : Very agitated and depressed. Restless, solitary, suicidal, hallucinated. Monosyllabic replies to questions. Habits indifferent. Unemployable.

After : Report made $1\frac{6}{7}$ years later. Mildly anxious, solitary. Talks to himself. But more approachable and works well on Farm. Habits clean.

No. 522. F. Schizophrenia. Duration 11 years

Before : Hallucinated, destructive, tearing clothing, nude. Habits regressed.

After : Report made $2\frac{1}{2}$ years later. Clean, tidy, helps in ward. Hebetude affect.

No. 935. *F. Epilepsy. Duration several years*

Before : Subject to furores. Extremely aggressive and violent.

After : Report made at unstated interval after operation. ++ Improved. No furores or violence. Has twice been out "on trial" for several weeks at a time.

No. 924. *F. Schizophrenia. Duration 6 years*

Before : Catatonic. Stupor and excitement. Impulsive screaming bouts.

After : Report made 3 years later. No stupor. Improvement in behaviour. Placid and contented, works well. Persistent nocturnal enuresis. Gained 2 stone in weight.

No. 782. *M. Schizophrenia with dementia. Duration 1 $\frac{1}{2}$ year*

Before : Demented, destructive and dirty. Hallucinated and impulsive. Confined to bed. Previously had E.C.T.

After : Report made $\frac{5}{12}$ year later. Up every day. Clean and tidy in person. Works in garden under supervision. No initiative but quiet and pleasant. Seems to be still hallucinated but hallucination not obtrusive.

(2) DISCHARGED IMPROVED (6 CASES)

No. 591. *M. Schizophrenia simplex. Duration 1 $\frac{5}{12}$ year*

Before : Off the point in thought and language. Threateningly aggressive especially towards mother.

After : Report made 1 $\frac{9}{12}$ years later. At home employed. Not so paralogical. Docile, submissive, aggression disappeared. Helps mother in simple tasks.

No. 695. *F. Agitated Melancholia. Duration 2 $\frac{3}{12}$ years*

Before : Depressed. Agitated. Guilt feelings. Suicidal. Mildly hallucinated. Somatic delusions, unemployed.

After : Report made 2 $\frac{7}{12}$ years later. Much improved. Not agitated. Brighter and occupied, but somewhat deteriorated. Not suicidal.

No. 221. *F. Chronic Melancholia. Duration 1 $\frac{6}{12}$ year*

Before : She was fearful, very depressed, had severe nightmares, complained of a feeling of tension, feared the dark and punishment; constantly mutilated herself in order to attract attention.

After : Report made $\frac{5}{12}$ year later. She had mild persecutory ideas, complained she never slept which was untrue, but still had severe nightmares. Still mutilated herself but to a lesser degree. Still complained of tension. Left relieved.

No. 224. *M. Schizophrenia Paranoid. Duration 1 $\frac{1}{12}$ year*

Before : Delusions of persecution. Would not eat his food, said it contained a poison to make him a lunatic. Stated that strange voices called him foul names. He was unstable, bad-tempered, depressed and miserable.

After : Report made $\frac{5}{12}$ year later. Quiet, rational, co-operative, rather slow in manner and speech.

No. 453. *F. Schizophrenia. Duration 9 years*

Before : Erratic, disjointed thoughts. Auditory hallucinations.

After : Report made 1 year later. Much improved. Normal except for being a little idle and erratic (always erratic and hysterical).

No. 167. *M. Non-systematized delusional insanity. Duration 5 years*

Before : Has delusions of his wife's infidelity, supernatural appearances and electrical influences.

After : Report made at unstated interval after operation. Claimed to have lost his delusions. Fairly cheerful but dull.

(3) DISCHARGED RECOVERED (6 CASES)

No. 367 F. Catatonic Schizophrenia. Duration 3 years

Before : Varies from resistive stupor to hostile aggressivity. Hallucinatory conduct with periods of partial remission. Previous treatment, 45 fits with some temporary improvement.

After : Reports made at intervals as below. Discharged $\frac{6}{12}$ year after operation, after 4 weeks at home. Came to see me $1\frac{5}{12}$ year after operation, looked well and had put on weight. Has had 3 jobs for short periods but obviously lacks perseverance and easily gets bored. $\frac{4}{12}$ year later, visited. For ten weeks has been a bus conductress and is living in comfortable lodgings. Average earnings £4.7.0 to £4.17.0. Has to get up at 5.30 some mornings. Looks very well and is very cheerful and happy. She is completely care-free and nothing seems to worry her. $2\frac{8}{12}$ years after operation—is now with Corporation. Recovery.

No. 809. F. Catatonic Schizophrenia. Duration 6 years

Before : Periodically noisy, attacking.

After : Report made $1\frac{9}{12}$ years later. Kind and cheerful, hostility disappeared.

No. 848. M. Catatonic Schizophrenia. Duration $1\frac{7}{12}$ year

Before : Hallucinated, fatuous, no initiative.

After : Report made $\frac{11}{12}$ year later. Co-operative, good insight.

No. 920. F. Paraphrenia. Duration 8 years

Before : Deluded, hallucinated, asocial, irritable.

After : Report made at unstated interval after operation. Calm, more sociable, indifferent to delusions.

No. 60. F. Obsessional neurosis. Duration 20 years

Before : Full of obsessions, doubts and fears. Unable to decide ordinary affairs of life e.g.—what to wear, whether to go out, read, write or sew. Could not walk any distance because of counting her steps in fours, and had to cycle. Actually brought her cycle to hospital fixed to her taxi.

After : Report made $\frac{6}{12}$ year later. Describes how each symptom has receded in turn. Can perform all daily tasks without difficulty. Walks comfortably and has never cycled since leaving hospital.

No. 492. M. Schizophrenia. Duration 1 year

Before : Grossly hallucinated, lacking in interest, unable to work.

After : Report made 2 years later. Works very well in his original job. Appears quite well.

INDEX

<i>Aberdeen Royal Mental Hospital</i>	...	...	...	...	...	...	...	...	5
Age, results according to	...	...	...	...	...	...	...	...	12
Agitation	...	...	...	...	...	...	...	...	17
Apparent suicidal intent	...	...	...	...	...	...	...	...	17
"As before" cases	...	...	...	...	...	...	...	...	15
Asthma	...	...	...	...	...	...	...	...	19
Behaviour, difficult	...	...	...	...	...	...	...	...	16
Behaviour, particular forms of	...	...	...	...	...	...	...	...	16
Behaviour, social	...	...	...	...	...	...	...	...	16
Bodily changes	...	...	...	...	...	...	...	...	23
Causes of death	...	...	...	...	...	...	...	...	24
"Citizen" cases	...	...	...	...	...	...	...	...	15
Classification of cases	...	...	...	...	...	...	...	...	8
Clinical groupings	...	...	...	...	...	...	...	...	15
Clinical results	...	...	...	...	...	...	...	...	14
Complications of operation	...	...	...	...	...	...	...	...	22
Conclusions	...	...	...	...	...	...	...	...	22
Confusion	...	...	...	...	...	...	...	...	19
Consciousness of self	...	...	...	...	...	...	...	...	6
Convulsion treatment (and fits)	...	...	...	...	...	...	...	...	26
"Co-operative" cases	...	...	...	...	...	...	...	...	15
<i>Crichton Royal Institution</i>	...	...	...	...	...	...	...	...	5
Death, causes of	...	...	...	...	...	...	...	...	24
Deaths	...	...	...	...	...	...	...	...	8, 9
Delusion	...	...	...	...	...	...	...	...	17
Delusional insanity	...	...	...	...	...	...	...	...	9
Depersonalization	...	...	...	...	...	...	...	...	21
Depression	...	...	...	...	...	...	...	...	17
Diagnosis, results according to	...	...	...	...	...	...	...	...	8
Difficult behaviour	...	...	...	...	...	...	...	...	16
Discharges	...	...	...	...	...	...	...	...	8-13
Duration, results according to	...	...	...	...	...	...	...	...	12
Emotion, tension of	...	...	...	...	...	...	...	...	6
Emotion, possible dulling of	...	...	...	...	...	...	...	...	6, 19
Epilepsy, leucotomy in	...	...	...	...	...	...	...	...	9
Epilepsy, results	...	...	...	...	...	...	...	...	9
Epileptiform fits <i>see</i> Fits.									
Excitement	...	...	...	...	...	...	...	...	17
Fits after leucotomy	...	...	...	...	...	...	...	...	6, 14, 19
Follow-up of cases	...	...	...	...	...	...	...	...	23
<i>Freeman, W. J.</i>	...	...	...	...	...	...	...	...	6
<i>Freeman, W. J. and Watts, J. W.</i>	...	...	...	...	...	...	...	...	6
Frontal lobe symptoms	...	...	...	...	...	...	...	...	23
Fronto-thalamic tract	...	...	...	...	...	...	...	...	5, 6

Habit of work	...	...	...	...	...	...	...	...	...	...	...	16
Hæmorrhage	...	...	...	...	...	...	...	...	...	...	...	6, 15
Hallucination	...	...	...	...	...	...	...	...	...	...	...	17
Homicidal case	...	...	...	...	...	...	...	...	...	...	...	19
Hospital, cases still in	...	...	...	...	...	...	...	...	...	...	...	8-10, 13
<i>Hutton, E. L.</i>	...	...	...	...	...	...	...	...	...	...	...	19
Illustrative cases	...	...	...	...	...	...	...	...	...	...	...	26
Improved cases	...	...	...	...	...	...	...	...	...	...	...	8-13, 26
Insulin shock therapy	...	...	...	...	...	...	...	...	...	...	...	12
Intelligence	...	...	...	...	...	...	...	...	...	...	...	14, 23
Interesting points noted	...	...	...	...	...	...	...	...	...	...	...	19
Introduction	...	...	...	...	...	...	...	...	...	...	...	5
Involutional melancholia	...	...	...	...	...	...	...	...	...	...	...	8
Leucotomy, definition of	...	...	...	...	...	...	...	...	...	...	...	5
Manic-depressive insanity	...	...	...	...	...	...	...	...	...	...	...	8-13, 16-18
Marriage after leucotomy	...	...	...	...	...	...	...	...	...	...	...	19
Mental defect, leucotomy in	...	...	...	...	...	...	...	...	...	...	...	9
Mental defect, results	...	...	...	...	...	...	...	...	...	...	...	9
Mental powers	...	...	...	...	...	...	...	...	...	...	...	23
<i>Meyer, A.</i>	...	...	...	...	...	...	...	...	...	...	...	6
"Milder" cases	...	...	...	...	...	...	...	...	...	...	...	15
<i>Moniz, Egas</i>	...	...	...	...	...	...	...	...	...	...	...	6
Mortality rate	...	...	...	...	...	...	...	...	...	...	...	8, 21
Neurosis	...	...	...	...	...	...	...	...	...	...	...	9
Neurosis, obsessional	...	...	...	...	...	...	...	...	...	...	...	9, 16-18
"No change" cases	...	...	...	...	...	...	...	...	...	...	...	8, 9
Nucleus medialis dorsalis	...	...	...	...	...	...	...	...	...	...	...	5, 6
Obsession	...	...	...	...	...	...	...	...	...	...	...	17
Obsessional neurosis	...	...	...	...	...	...	...	...	...	...	...	9, 16-18
Operation	...	...	...	...	...	...	...	...	...	...	...	5, 22, 23
Operation, deaths due to	...	...	...	...	...	...	...	...	...	...	...	8, 24
Pain, leucotomy and	...	...	...	...	...	...	...	...	...	...	...	6
Particular forms of behaviour	...	...	...	...	...	...	...	...	...	...	...	14, 16
Particular symptoms	...	...	...	...	...	...	...	...	...	...	...	14, 17
Personality, definitions	...	...	...	...	...	...	...	...	...	...	...	19
Personality, possible changes of	...	...	...	...	...	...	...	...	...	...	...	6, 19, 23
Post-encephalitis, leucotomy in	...	...	...	...	...	...	...	...	...	...	...	9
Psoriasis	...	...	...	...	...	...	...	...	...	...	...	19
Questionnaire of present survey	...	...	...	...	...	...	...	...	...	...	...	7

Recovered cases	...	...	...	...	...	...	...	...	8-13, 28
Re-education	...	...	...	...	...	...	...	...	6
Relapses	...	...	...	...	...	...	...	...	8, 23
Results, clinical	...	...	...	...	...	...	...	...	14
Results, statistical	...	...	...	...	...	...	...	...	8
Results, variously analysed	...	...	...	...	...	...	...	...	8-13
Risks, operative	...	...	...	...	...	...	...	...	6
 Schizophrenia	...	...	...	...	...	...	...	...	8-13, 16-18
Selection of cases	...	...	...	...	...	...	...	...	13, 23
Severity of disorder in cases in present survey									13
Sex, results according to	...	...	...	...	...	...	...	...	12
Social behaviour	...	...	...	...	...	...	...	...	14
Symptoms as a whole	...	...	...	...	...	...	...	...	14, 17
Symptoms, particular	...	...	...	...	...	...	...	...	14, 17
Suicidal intent, apparent	...	...	...	...	...	...	...	...	17
Summary and conclusions	...	...	...	...	...	...	...	...	21
 <i>Temporary Commission on State Hospital Problems (New York)</i>									12
Tension, emotional	...	...	...	...	...	...	...	...	5
Treatments, post-operative	...	...	...	...	...	...	...	...	23
 Various cases, results in	...	...	...	...	...	...	...	...	9
Violence	...	...	...	...	...	...	...	...	16
 <i>Watts, J. W....</i>	...	...	...	...	...	...	...	...	6
"Worse" cases	...	...	...	...	...	...	...	...	8, 15, 25

LONDON

PRINTED AND PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

To be purchased directly from H.M. STATIONERY OFFICE at the following addresses :
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